

CONTINUOUS IMPROVEMENT PROJECT DATABASE

LABOR HOUR SAVINGS PROJECTS

Project Name	Project Description	Division	Project Year	Contact Name	Contact Number
Certification & Bridge Coating	<p>NCDOT has approximately 5000 bridges in the state that were coated with lead paint before it was known to be a hazardous material when it is being removed. When 29CFR 1926.62 was enacted, it became part of the responsibility of the Chemical Laboratory, Materials and Tests Unit, to determine if lead paint existed on a bridge, needed to be stripped and recoated, or removed and spot painted.</p> <p>There were a number of solutions, such as: 1) hire a staff of inspectors to cover bridge painting and lead abatement projects across the state and certify inspectors already in the workforce; 2) hire CEI firms which would have been an expensive solution (4 times our in-house costs); 3) train the inspectors already in the field prior to a project being let in their area. Training the inspectors already in the field - a "train on-demand" concept was the best solution. This allows the instructor and assistant to become mentors, troubleshooters and experts when needed on the projects.</p> <p>The "train on-demand" concept became a nationally recognized certification course consisting of a 2-day classroom instruction, with hands-on training, testing with equipment used in the field, a textbook, as well as a reference for inspectors. An exam is given requiring a passing grade of 70% and a certificate showing the course was completed and passed.</p>	Materials & Tests	2009	Chris Peoples	(919)329-4090
Backhoe Mounted Guardrail Excavator	<p>The problem related to cleaning away the accumulated buildup of soil from under the guardrail. In mountain counties there is little room to get behind the guardrail to clear away excess soil buildup. In most areas the only way to clear away this buildup is to remove the guardrail and excavate the material and then reset the guardrail.</p> <p>The team decided to fabricate an attachment that would do this without the need to remove the guardrail. We took an old backhoe bucket and old motor grader blade and added steel to extend the length of the backhoe bucket to form a three-foot motorgrader blade extension.</p> <p>When this new attachment is used to replace the bucket on the backhoe, material can be pushed out from the backside of the guardrail or pulled through under the guardrail to be picked up by a belt loader or wasted over the fill or shoulder. This tool has the versatility to both push and pull material.</p>	Division 11 - Avery Maintenance	2009	Jerry Combs	(828) 625-5334
Robotic Total Station Surveying Equipment	<p>The safety procedures adopted by the Signals & Geometrics Section of the ITS & Signals Unit require a spotter be present with the rodman to ensure the rodman's safety when performing stadia surveys of existing intersections for signalization at high speed locations. The section is not able to obtain new positions to meet the increasing workload related to safe, efficient designs for traffic signals along the state highway system. A team was formed to investigate a means to more effectively utilize manpower for stadia surveys.</p> <p>Robotic total station survey (RTSS) equipment is the most effective & economical means to utilize manpower for stadia surveys. RTSS equipment requires fewer employees on a survey team and it enables employees to develop traffic signal plans utilizing less manpower while maintaining required survey stadia accuracy and safety for employees. The NCDOT Locations & Surveys Unit ensured that the equipment purchased would meet the needs of the section and be compatible with equipment used by other units within NCDOT.</p> <p>Manpower required for a survey team has been reduced by one person for high-speed locations requiring a stadia survey and resulted in saving 10 to 25 percent in field survey time.</p>	Traffic Engineering & Safety Systems and ITS Signa	2009	Nathanial Bitting	
Approved Encroachment Cross-Reference Map	<p>Approved Encroachment or driveway permits were difficult to locate because they were never cross-referenced so that district staff could locate them. For example, if a municipality contacted the district office and wanted to know what type of encroachments existed on a particular SR route then the staff was forced to search through all encroachments to find the needed information. A county map was used to color code all approved encroachments and referenced by a file number that allows staff to easily locate the approved documentation. Files for approved encroachments and driveways were filed by city, utility company, and/or individuals. An Excel worksheet was created that logged the reference number (which was logged on the map as well), date received, date approved, location, encroachment type, and any other remarks for each encroachment agreement. The spreadsheet can be sorted by information type to reduce the time required by staff to locate specific data.</p> <p>The color-coded map helps staff to immediately identify the type of encroachment at each location. By providing the reference number on the map, time needed to locate approved encroachment data was significantly reduced. This greatly improves customer service, reduces labor time and keeps data easily accessible.</p>	Div 12	2009	Caroline Dedmon	

Earthwork Computation Spreadsheet	<p>The problem was reflected in the time and training required to compute earthwork volume for estimated and final quantities to be paid on construction projects.</p> <p>A spreadsheet was created to enable anyone to enter data from x-section notes or plotted areas. Entry does not require any special training and can be used by anyone. It is helpful in establishing estimated quantities of earthwork throughout a project as well as computing exact final quantities.</p> <p>The user is able to enter as much or as little information as warranted to obtain results at any stage of the project. If estimated quantities are needed and it is known that earthwork will continue in the same area, it may not be necessary to use all shots taken.</p> <p>The spreadsheet can be updated to produce the exact quantities as the need arises. This improvement enables tracking of earthwork quantities paid and generates a source document for final quantities</p>	Div 10	2009	Hilda Beck	
Stormwater Pollution Prevention Plan (SPPP/SPCC-IIP)	<p>Problem: The SPPP and the SPCC programs are paper and process intensive programs that require reporting and updating over time. The initial versions were hard copy documents that were soon out of date after the program was established. Reprinting and coordinating updates required significant resources and staff. In addition, programs required reporting which would have resulted in thousands of hard copy documents being sent to a central location.</p> <p>Solution: Development of an internet based management system that allowed for the over one-hundred and fifty (150) end users across the state to input, update, and receive information in an efficient process that facilitates communication and control while maintaining environmental compliance</p> <p>Results: The benefits of an integrated SPPP/SPCC Plan include:</p> <ul style="list-style-type: none"> The ability to readily access regulatory information from different locations; Streamlined management and the ability to efficiently make global changes; Version control and assurance that each facility's Plans are up-to-date and in compliance; Centrally located data that can be verified by the appropriate users; Readily accessible performance measures for compliance checks; Elimination of thousands of hard copy records per year; Ability to update and assign compliance personnel from local or centralized location; and Maintain a sustainable system that can be managed with minimal resources 	Roadside Environmental/Hydraulics Unit, Web Service	2008	Johnie Marion	(919)-861-3770
Truck in a Box (TIB)	<p>Problem:</p> <p>It is hard to find wiring problems by yourself. It is not easy or convenient or cost effective to pull someone in to assist in the diagnostics of wiring of trucks and trailers.</p> <p>Solution:</p> <p>To design a box to set beside the truck so that one person can diagnose wiring problems, something that would be easily moved, easily read and easily understood while directing your attention to the cause of a problem and to help in the set up of wiring DOT truck and trailer equipment in the same manner to remove a lot of guess work.</p> <p>Results:</p> <p>The results have been a quicker and easier method of checking truck and trailer plugs. TIB has reduced time and labor which is equivalent to money. TIB is not expensive to build or to maintain. It has located misaligned wires in the trailer receptacle and trailer brake box, discovering that the trailer was wired backwards or not DOT specifications</p>	Division 7 Camp Burton Sub Shop	2008	Mark Brooks	(919)375-5831
Vibratory Plate Tamps	<p>Problem:</p> <p>Many of our small dump trucks tied up pulling patch rollers and not available for other operations.</p> <p>Solution:</p> <p>At the yearly equipment buy, I requested plate tamps for each of the patch crews. Each crew was assigned a tamp and used for most potholes.</p> <p>Results:</p> <p>Having 5 fulltime patch crews we used to have 5 small dump trucks tied up with patching and paving operations. Since implementing the vibratory plate tamps only 2 crews need the use of rollers and dump trucks to transport them. The full depth patch crew and the paving crew still need the larger rollers, but the trucks are also used for these operations to transport material. 3 small dumps are now available to be sent on other operations. After evaluating the plate tamps we were also able to reduce our roller and trailer compliment by 2 each.</p>	Div 10 / Union Maintenance	2008	David Gillette	(704) 283-5941

Mobile Column Lifts	<p>Problem: Much of the work performed in the Albemarle Shop is related to preventative maintenance. This requires vehicles to be raised for all service and brake inspections. This work was being performed with floor jacks and jack stands. Also, technicians had to work while lying on creepers on the floor.</p> <p>Solution: Due to the completion of a new facility at the Albemarle Shop we now have enough ceiling height to install a lift system. The type chosen was a mobile column lift. This allows lifts to be utilized in any of the seven (7) open bays.</p> <p>Results: Faster and safe lifting of equipment. We are now able to work standing under trucks. No longer need to lie on creepers under equipment. Much safer and more productive.</p>	Division 10 Equipment	2007	Ricky R. Mabry	(704)-596-2131
Electronic Distribution of Memorandums	<p>Problem: The Congestion Management Section observed the following items related to distribution of our memorandums (1) traditional distribution of our memorandums was consuming a lot of office paper and energy, (2) memorandums that were being sent out by mail were being distributed through our courier service, which was consuming gas at increasing prices, and (3) units were receiving multiple copies of our memorandum thus wasting paper and energy.</p> <p>Solution: The Access Review, MSTA, and Plan Review squads implemented multiple pilot projects throughout 2006 to determine the feasibility of electronic distribution of our memorandums. Since we were receiving positive feedback from our recipients, we implemented full scale electronic distribution.</p>	Preconstruction-Congestion Management	2007	Erin Hardee	(919) 773-2884.
Loading TIP Data into SAP Tool	<p>Problem: Extensive time and personnel were expended to manually transfer the latest TIP Data into the SAP//PMII system. It was slow and tedious, with a significant financial and scheduling risk resulting from input delays or data inaccuracies. It took approximate 2560 hours to manually enter TIP data.</p> <p>Solution: We automated the annual TIP Data entry, improving the timeliness and accuracy of the data transfer, decreasing the financial and scheduling risk and freeing up personnel for other assignments</p>	Financial Management–Project Development	2007	Majed Al-Ghandour	(919) 733- 2039
Guardrail Location Mapping	<p>Problem: While there are lists of secondary road numbers, there is no indication of exactly where the actual sections of guardrails were located. Many man-hours have been spent searching entire secondary routes in an effort to find the exact locations of guardrail sections in order to maintain uncontrolled vegetation by spraying operations and vegetation management.</p> <p>Solution: The sections of guardrail were documented on existing maps and then transferred onto new county maps. Those sections were highlighted according to route type.</p>	Operations Division 5	2007	Mark Conner	(919) 733-7141
Salt Spreader Stands	<p>Problem: Division 10 Bituminous unit had 5 of our salt spreaders sitting on concrete barriers wall. An employee has to climb up the concrete barriers to get on top of the salt spreader unit. Once on top of the spreader, the employee hooks the four-legged chain. Then the employee has to climb down off of the spreaders using the concrete barrier as a stepping stool. After this operation is completed, the boom truck operator or loader operator takes control of the operation. There are two ground guides and a spotter; the spotter directs the truck operator.</p> <p>Solution: Division 10 Bituminous purchased 5 Swenson leg stands. These stands have reduced the number of needed personnel, eased the workload on the crew, eliminated overhead hazards, prevented slips, falls and pinch points and freed up personnel.</p>	Operations Division 10	2007	Chip Speight	(704)782-0714
Vibratory Plate Tamps	<p>Problem: Many of our small dump trucks have been tied up pulling patch rollers and not available for other operations.</p> <p>Solution: At the yearly equipment buy, I requested plate tamps for each of the patch crews. Each crew was assigned a tamp which is used for most potholes. This would allow unutilized trucks not just sitting on jobs which also improves the unit cost for patching operations</p>	Operations – Division 10	2007	David Gillette	(704) 283-5941.
Erosion Control Quantity Mapper	<p>Problem: There was an increased workload on Soil and Water Engineering Section staff from TIP letting schedule and other POC projects.</p> <p>Solution: Reduce the time required to compile and estimate erosion control quantities to allow more time for erosion control plan production. By nature of NCDOT erosion control standards and Microstation/Geopak quantity computation methods, the EC quantities are scrambled throughout the EC design spreadsheets and are not organized consistent to the master EC quantity spreadsheet. The EC Quantity Mapper serves as a link between EC design spreadsheets and the master EC quantity spreadsheet, and allows for Soil and Water Engineering staff to copy and paste quantity values from the EC design sheets to the Mapper. Then, the Mapper arranges the quantities for copying and pasting into the master EC quantity spreadsheet.</p>	Operations - Roadside Environmental Unit	2007	Barney Blackburn	(919)-733-2920

Stormwater Pollution Prevention Plan and Spill Prevention Control	<p>Problem: The SPPP and the SPCC programs are paper and process intensive programs that require reporting and updating over time. The initial versions were hard copy documents that were soon out of date after the program was established. Reprinting and coordinating updates required significant resources and staff. In addition, programs required reporting which would have resulted in thousands of hard copy documents being sent to a central location.</p> <p>Solution: Development of an internet based management system that allowed for the over one-hundred and fifty (150) end users across the state to input, update, and receive information in an efficient process that facilitates communication and control while maintaining environmental compliance.</p>	Operations Roadside Environmental	2007	Johnie Marion	(919) 861-3770.
Robotic Total Station Surveying Equipment	<p>Problem: The safety procedures adopted by the Signals & Geometrics Section of the ITS & Signals Unit require a spotter be present with the rodman to ensure the rodman's safety when performing stadia surveys of existing intersections for signalization at high speed locations. The Section will not be able to obtain new positions for an increasing workload associated with its responsibility to provide safe, efficient designs for traffic signals along the state highway system. A team was formed to investigate a means to more effectively utilize manpower for stadia surveys.</p> <p>Solution: Robotic total station survey (RTSS) equipment is the most effective & economical means to utilize manpower for stadia surveys. RTSS equipment allowed fewer employees on a survey team and it enabled employees to develop traffic signal plans utilizing less manpower while maintaining required survey stadia accuracy without decreasing safety for employees. The NCDOT Locations & Surveys Unit ensured that the equipment purchased would meet the needs of the Section and be compatible with equipment used by other Units within NCDOT.</p>	Preconstruction - Traffic Engineering	2006	Richard Mullinax	(919) 733-5569
Development of a Simplified Method for Predicting Dead Load Deflections of Steel Plate Girders	<p>Problem: Bridges are being constructed with longer spans, higher skews, and/or in stages to minimize traffic interruptions or environmental impacts. Over the last few years, matching final deck elevations to the plan elevations has become a problem since the predicted deflection of steel plate girders does not match the actual deflections measured in the field. The current deflection prediction is based on a single girder line analysis that doesn't take into account skew or stiffness of adjacent girders.</p> <p>Solution: The solution to this problem of extensive computer modeling was to create an empirically based simplified method that would significantly reduce the amount of time required to predict the deflection of steel plate girders. It takes into account the effects of bridge skew, girder length, girder spacing, cross-frame stiffness, in-place deck slab thickness & composite action on a portion of the girder length. Structure Design partnered with NCSU in a research project. Taking what NCSU had done, Structure Design created a simple spreadsheet program that incorporates the empirically based method and that is now integrated directly into the design process.</p>	Preconstruction - Highway Design	2006	Tom Koch	(919) 250-4037
Approved Encroachment Cross-Reference Map	<p>Problem: Approved Encroachment or driveway permits were difficult to locate because they were never cross-referenced so that district staff could locate them. For example if a municipality contacted the district office and wanted to know what type of encroachments existed on a particular SR route then the staff was forced to search through all encroachments to find the needed information.</p> <p>Solution: A county map was used to color code all approved encroachments and referenced by a file number that allows staff to easily locate the approved documentation. Files for approved encroachments and driveways were filed by city, utility company, and/or individuals. An excel worksheet was also created that logged the reference number (which was logged on the map as well), date received, date approved, location, encroachment type, and any other remarks for each encroachment agreement. The spreadsheet can be sorted or filtered by information type to reduce the time required by staff to reduce labor time when looking for specific data.</p>	Operations - Division 12	2006	Caroline Dedmon	(704) 480-5425
Backhoe Mounted Guardrail Excavator	<p>Problem: The problem we were having was the capability of cleaning away the accumulated buildup of soil from under the guardrail. In mountain counties there is little room to get behind the guardrail to clear away excess soil buildup. In most areas the only way to clear away this buildup is to remove the guardrail and excavate the material and then reset the guardrail.</p> <p>Solution: Our team decided to fabricate an attachment that would do this without the need to remove the guardrail. We took an old backhoe bucket and old motor grader blade and purchased some steel and extended the length of the backhoe bucket to form a three-foot extension with the motorgrader blade on the front edge. The motorgrader blade is replaceable and can be made wider or narrower.</p>	Operations - Division 11	2006	Jerry Combs	(828) 265-5380

Earthwork Computation Spreadsheet	<p>Problem: Time and training required to compute earthwork volume for estimated and final quantities to be paid on construction projects.</p> <p>Solution: A spreadsheet was created to enable anyone to enter data from x-section notes or plotted areas. Entry does not require any special training and can be used by anyone. It is helpful in establishing estimated quantities of earthwork throughout a project as well as computing exact final quantities.</p>	Operations - Division 10	2006	Margaret Hough	(704) 394-8314
Drainage Improvements	<p>Problem: Beavers were causing a drainage problem on several roads by building dams inside of crossline pipes.</p> <p>Solution: The maintenance department made several gates to prohibit debris from entering the pipe. The gates were built with #5 rebar and could be removed easily with a backhoe.</p>	Operations - Division 3	2006	L.E. Reynolds	(910) 592-1434
Utilization of GPS RTK (with and without NRTK) in Stakeout	In field surveying, the location of points (aerial targets, property corners, drainage features, edges of pavement, etc.) is time-consuming. Using traditional survey methods, a 3-person survey crew has to traverse distance to locate or set points. Prior to fieldwork, often-complex calculations are necessary to determine angles & distances. Someone must compute the desired information from recorded notes requiring substantial man-hours. With GPS RTK (Real Time Kinematic) Surveys, fewer personnel are needed for fieldwork & traversing is no longer necessary. This results in greater accuracy & reduced field time, both in elapsed procedure time & man-hours. Since data is electronic, office computations are substantially reduced or eliminated, resulting in a further man-hour reduction. In many cases, when an answer is needed right away, the GPS RTK information is immediate,	Preconstruction-Highway Design Branch	2005	Charles Brown	(919) 250-4109.
Skid Steer GR Blade	Our crew has the task of removing soil and debris from underneath the guardrail so water could sheet flow off the roadway. In the past, this task had to be done with a motor grader or manpower and shovels. This process was very time consuming and labor intensive. In order to save time, we designed a blade apparatus that fits on the fork of a skid steer loader. The device allows the operator to push the material out from under the guardrail and off the slope and enable a backhoe or force feed loader to pick it up. This device saves labor hours.	Operations- Division 13	2005	Gabriel Johnson	(828) 625-4024
Rapid Frame	While framing for concrete lids for junction boxes, drop inlets and catch basins lumber always had to be cut for the particular box size. Thus causing a waste in lumber and man-hours to build for each. The solution was the Rapid Frame, which consists of 4 pieces of lumber and 4 T-channels. All can be reused by simply adjusting to the lid size required and tack nail T-channels.	Operations- Division 6	2005	G.M. Taylor	(910) 486-1421.
Pavement Condition Survey Data Entry Project	For 20 years, NCDOT has conducted a biannual Pavement Condition Survey (PCS) of NC highways. The survey is conducted using pre-printed forms. After completion, the results of the surveys are keyed in by personnel in the field offices. The results of the survey are then used to calculate funding needs for NCDOT road maintenance, distribution of hundreds of millions of maintenance dollars & to track the long-term performance of the highway network. From 1982 to 2002, data entry and reporting was carried out on a mainframe system. For the last decade, data has been transferred from the mainframe to an Oracle database for long-term storage & data modeling purposes. After this transfer it was possible to conduct extensive error checking & perform QA/QC checks. The data was then uploaded back to the mainframe for final report generation. As the data set grew to 1,000,000 lines or more, it became difficult and time-consuming to maintain and update the data. New software was developed to allow direct entry into the Oracle system.	Operations- Asset Management	2005	Neil Mastin	(919) 250-4094.
Electronic Draft of the 12-Month Let List and the Design Build Let List	For many years Project Management sent as many as 500 copies of the 12-Month Let List and the Design-Build Let List to various consultants and preconstruction units every month. As a result of computer technology, it has been determined to be more beneficial both monetarily and from a human resource standpoint to utilize available resources to improve upon our service industry	Financial- Program Development	2005	David Rhodes	(919) 733-2039 ext 301.
Self Study Concrete Class	M&T offers a concrete certification class for field technicians. It takes 2 days of instruction and 1 day of tests. Limited seating and scheduling problems prohibited many field technicians from attending. A self-study class was developed to reduce the amount of time spent in class. During 2005 four self study class were held with an average attendance of 30 technicians who had to be away from their assigned duty station for only one day instead of three.	Construction-Materials and Tests	2005	Walton Jones	(919) 329-4221.
Access Management Signal Analysis Check List Program	The AM Group does approximately 1,000 annual analysis of Roadway Network files from private engineering firms. Data is text doc. by Signalized System Analyses Software (Synchro). The Process Management Section created an Access 97 Visual Basic application (Signal Analysis Check List) that reads the Synchro output, analyzes the data and outputs the data in both a macro and micro report format and stores the data for future retrieval. Before implementation of Signal Analysis Check List it took an hour to analyze an average file however, now it only takes 2 minutes.	Preconstruction-Traffic Engineering	2004	Louis Kudelka	(919)250-4151

Signing Rodeo Database	The Signing Section recognized a need for a tool that would organize and automate the registration and associated administration processes involved with the Signing Rodeo, a training program. Process Management developed an Access 97 database application that automates all recognized data centric business processes. Manually completing these tasks would take approximately 240 hours per training event.	Preconstruction-Traffic Engineering	2004	Louis Kudelka	(919)250-4151
Timesheet Data Entry Process	The timesheet data entry process required the same data to be entered into electronic spreadsheets twice. The process was redesigned to eliminate the second manual entry of timesheet data from the paper copy. A new spreadsheet was developed for NON-TIP employees and the Pmii spreadsheet was used for TIP employees. The first spread sheet is saved to the file server and the time entry personnel copy and paste directly into the SAP system.	Preconstruction-Traffic Engineering	2004	Jennifer Portanova	(919)250-4151
Research Program Management Database (eXpress)	Due to the high volume of research projects managed by The R&D unit, the large number of internal Department customers involved in guiding the research and the extensive list of universities and academic researchers conducting the research, the R & D Unit embarked on a plan to better organize the project information and management procedures. A database was constructed in modular fashion. Because of the database a higher percentage of time can be spent on assuring that research project objects are achieved and more attention is given to implementing the results.	Environment & Planning-Program Development	2004	R. Rochelle	(919)250-4128
LIDAR Utilization for Design Base Mapping	Accurate elevation data is required to produce base mapping products for functional, preliminary and final design. NCDOT collects this data using photogrammetric techniques. When other sources of current and accurate elevation data are available, the Photogrammetry Unit will utilize that data. NCFMP (North Carolina Floodplain Mapping Program) collected LIDAR (Light Detection and Ranging) elevation data in 2001 and 2003 for approximately 85% of the state. The availability of the NCFMP LIDAR elevation data has improved the Photogrammetry Unit's capacity to rapidly produce base mapping products in response to catastrophic emergency events such Hurricane Isabel. It has also enabled Photogrammetry to produce significantly more accurate base mapping for functional design.	Preconstruction-Highway Design	2004	Keith Johnston	(919)250-4001
Auger Shaft Seals	Auger bearings on the tailgate spreaders were failing prematurely due to the gap on the inner side of the bearing allowing salt contact with bearing face. Some were failing in as little as six months. To address this problem seal plates and seals were fabricated and installed. The process utilized recycled road signs and supplies. Spreaders without this modification require bearings replacement twice a year, with the modifications they have had the same bearing for three years with no signs of corrosion or internal wear.	Operations- Division 7	2004	Randy Richardson	(336)-668-2855
ERCON Database	The REU utilized a mainframe application to submit erosion and sedimentation control evaluations to Division Operations and Construction. The application had many limitations and had quickly become outdated. DOT Engineering Application Development, Highway Systems Support and REU developed a database and electronic distribution system that could be supported with laptop and desktop flexibility.	Construction-Roadside Environmental	2004	Ted Sherrod	(919)733-2920
New Information Technology	Obtaining accurate field data required site investigations or field meetings. Team developed method which utilized web sites aerial photography and GIS to acquire same data. New method saves time by reducing field investigations. Review time for projects has decreased by 50% and outstanding projects have been reduced by the same amount. Nearly 50,000 labor hours per year have been saved.	Traffic Engineering	2003	Gary Faulkner	(919)250-4151
Ddraft	Right of Way agents prepare all deeds and easement agreements associated with acquisition or purchase of rights of way and easement areas for projects. Average time to complete these was approximately 2 hours. A CADD section in the Branch was created to to draft the deed descriptions from electronic plans. Time required to to produce deed descriptions was reduced to 19 minutes for highway project and 25 minutes for bridge projects.Total time savings is 7,726 hours.	PreConstruction	2003	Grady Morris	(919) 733-7932
Network Print TIP	Printing and assembling TIP documents using offset printing is labor intensive consisting of 5 separately printed documents. Documents are printed at various intervals on odd/even years requiring several months and significant overtime. The team developed a plan to utilize electronic printing on CD technology on a Xerox 4890. Actual number of copies printed were reduced due to print on demand technology. It provided effective highlight color printing, reduced amount of errors and significantly reduced print production window. Documents were in-house outsourced to Mainframe/Network Printing operation at DMV. Total savings were 1,860 labor hours	Administration	2003	Keith Wilder	(919)715-0400
QC/QA Program for Epoxy Coating of Reinforcing Bars	Previously, inspection of epoxy coated rebar was done after it was loaded onto the truck which is very difficult. M&T implemented the QC/QA Program which requires the coater to take full responsibility for production and testing of coating process and includes having an internal quality control plan and maintaining CRSI certification. No price increase was incurred due to implementation of program. Annual savings for this implementation is over 3,100 hours and a related annual cost savings of \$150,000	Operations	2003	Cecil Jones	(919)733-7411

PR-139 Electronic Reporting	Civil Rights Compliance officers needed to have the method of checking, summarizing, and reporting of statistical information regarding minority and female employment on form PR-1391 (annual report federally mandated from contractors and subcontractors working on federally funded highway projects) improved. An electronic version was developed which identifies errors and eliminates the need for hand adding of hundreds of numbers. There is a request for the Construction Unit to make this electronic reporting available to the Resident Engineer Offices to expedite the submittal process.	ADMINISTRATION	2002	Candie Auvil	(919)733-2300
QMS HP-48 Calculator Program	performs sampling and testing of Asphalt pavements. It is done in the laboratory and roadway. The data obtained is must be accurate as the data is used to determine if the payment will be a full contract price. The technician involved in the sampling and testing must perform many mathematical calculations without error in a timely manner. A series of programs were developed for the HP-48 programmable calculator to make it easy to perform the mathematical calculations for the QA/QC technician. The programs are used in conjunction with NCDOT forms. The programs ask the user to input the data at the correct interval, performs the calculations and gives the user the correct answer	OPERATIONS - DIVISION 14	2002	Dan Hunter	(828) 586-2141
Injection Truck	When calculating the amount of material per acre, the injection system takes 50% less time than the conventional method. The computer on the injection system does the calculations and has been tested 100% accurate. Also, the injection tanks mixes the accurate amount of material needed, eliminating guesswork and reducing wastes/overage. At day's end all work accomplished can be printed out. In past there was a need for a crash truck, advance warning and a sign crew (4 pieces of equipment and 5 men). Now 1 man and 1 piece of equipment do the same task. It has also improved safety in that it is off road and not endangering the public. All work is done out of travel lanes.	OPERATIONS - DIVISION 9	2002	Jeff Hardy	(336) 896-7039
Tax Maps	Due to the increased workload on the District Office, a time saving method was needed to enable District staff to process secondary road and new addition packages in a timelier manner. All four required sets of each package were individually prepared and each package took 4 hours to assemble after the information was gathered. Most tax maps are now obtained through the use of compact disc, edited through Word, and then copies made from the original set.	OPERATIONS - DIVISION 9	2002	David Lipe	(704) 639-7560
Saturday CSWP Work Crew	DOT and DOC have been forced to cut back on personnel since Feb 2001. As a result, our office lost 63% of its regular patrol crews and DOC was unable to respond to any request for litter pick-ups due to a shortage of guards. For several years DOT and CSWP(Community Service Work Program) had severed their relationship due to conflicts. However to overcome the problems and past differences DOT's CPI team and CSWP met and were able to overcome the obstacles. CPI started utilizing the CSWP's Saturday pick-ups but also discovered several other useful ways to utilize this new resource.	OPERATIONS - DIVISION 7	2002	Michael Venable	(336) 570-6833
Modification to "Under Railer"	The original "Under Railer" would not push the spoil material under the guardrail and past the break point of the shoulder. It left a berm behind the guardrail which trapped water. We came up with the idea to attach the "Under Railer" to a motor grader and use the hydraulics of the grader to telescope the arm and blade out an additional 7-8 feet to roll spoil material over the bank.	OPERATIONS - DIVISION 14	2002	Mark Gibbs	(828) 891-7911
Combined State Form 19 & OSH 301	Incidents, injuries and accidents are required to be reported to two separate State agencies. In many cases the information and criteria to report is similar. However, historically, each agency has required the use of its particular form. (Form 19 for the NC Industria lCommission and a separate form for NC DOL, form 301.) This reporting requirement is applicable to a majority of the private sector, third party insurance companies and all state agencies. This created a duplication of effort. Research was done the see where areas of overlap occurred. Since information on the form is treated as data input, the form was developed to not interfere with that process. A consolidation of the forms was approved for use in June 2002.	SAFETY & LOSS CONTROL	2002	Chuck Stanfill	250-4200 x 243.
Utilization of Reports	Utilizing Bi-Weekly Budget Reports sent to Bridge Supervisors and Tech III. This report insures better planning and budgeting. Bridge Supervisors can use this to get work order numbers, plan workweek in advance, and road closings. This also helps them keep tabs on projects under construction and county highway construction. Tech III's use this report to plan work for setting grades and layout of some structures. This also helps keep up with permit status and when projects are complete	OPERATIONS - DIVISION 11	2002	J. F. Pendry	(336) 667-9111
Emergency Call-Out Program	The State Road Maintenance Unit is responsible for maintaining records of vehicles that respond to emergency call outs after normal working hours. Forms were filled out manually, then compiled, photocopied & sent in. It was then entered into an excel program which substantiate the need for commuting in state vehicles. This time consuming process created problems with information not being submitted to Divisions on time, confusion of types of calls, repeated handling, multiples copies of same material, accuracy and time used in verifying missing or inaccurate information. The Unit worked with IT in developing a web accessible database to capture the emergency callback information with the goal of most efficient way to obtain information, systematically enter it &generate reports in a quicker & more efficient manner.	CONSTRUCTION & MAINTENANCE	2002	Dianna Turner	(919) 733-3725.

Secondary Road Parcels	The District survey crew collects all data needed for plans on secondary road projects involving turn lanes and widening. When the data is collected a CAD tech will draw tax parcels. This process included: 1) Obtaining maps from tax dept. 2) CAD technicians scaling tax parcels and drawing them on respective project maps. This averaged 8-man hours/project. Using ARC VIEW software the process is now 30 minutes. Digital data is obtained from county Tax dept and the data is converted into a format that can be then imported to Mico-station. Once the data is in Micro-Station the CAD techs rotate and scale the parcels.	OPERATIONS - DIVISION 8	2002	Reuben Blakley	(336) 629-1423.
DMV Fiscal Refund System	The DMV Fiscal Section issues refund checks to customers who have overpaid for license renewals, personalized tags and the like. Issuing more than 5,000 refunds/month through an antiquated system created in 1983 with limited functionality. It is largely a manual effort that is prone to error, creates a strain on resources and limits a timely response to customer inquiries, becoming more difficult to manage as the volume increases. The ITBUS team redesigned the existing system by adding new functionality to complement the current functionality. The goal was to automate the manual effort of processing refunds. To redesign -1) Document the current 'As Is' refund process to determine what areas could be improved. 2) Document the user requirements for the existing functionality and all improvements. 3) Create a Detail Design document of the new refund system to use as a guide for programming and implementing the new refund system.	INFORMATION TECHNOLOGY	2002	Eric Lingerfelt	(919) 508-1790.
Disaster Recovery Query Application	When there is a federally declared disaster, NCDOT receives funds from 2 federal agencies for cleanup & relief work. FHWA & FEMA require extensive data to verify the claims for reimbursement. NCDOT must prepare their applications for reimbursement carefully to ensure that all eligible funds will be claimed. This preparation relies extensively on data stored on mainframe computer systems even though the systems are not designed to manage the data needed by FHWA and FEMA. Data gathering traditionally consisted of calls placed to ITBUS to run reports for each disaster. The reports were analyzed by the Disaster Recovery Team (DRT) and were manually entered into spreadsheets for analysis, averaging 7 reports/week. The solution consisted of a mainframe program coupled with a Microsoft Access application. The mainframe program generates a file for each disaster that contains complete data necessary for FHWA or FEMA applications. The Access application allows DRT to import the disaster-specific data, run queries on the data & exports the data to their analysis spreadsheets.	DEPARTMENT OF TRANSPORTATION	2002	Cora Bright	(919) 508-1878
3D Measurement Implementation	NCDOT has attempted to obtain reliable route & milepost information for decades. Due to the creation of the Linear Referencing System (LRS) for the purpose of sharing (or linking) data between multiple data sets this information has become very important. The primary way of collecting route and milepost information was the use of an automobile mounted survey meter. A 2-man team would be sent to the subject location & record measurements on paper maps, which is used to update information for mileage dependent database tables. This time consuming process allowed many errors. These errors in the DOT mileage database were unacceptable for the building of the LRS. The GIS Unit has developed a procedure for identifying accurate milepost information. Graphical linework was moved to match corresponding locations on photography. This process is called photo-revision. Revised linework is overlaid on Digital Elevation Model data to generate 3D measurements, which are extremely accurate. The difference between 3D & survey meter measurements are within a hundredth of a mile per half-mile section of road.	GIS	2002	Chris Tilley	(919) 212-6040.
Project Management Database	The Traffic Control Section was using a local database to track TIP Project assignments, lettings and manday requirements. Section personnel including data from other systems and printed materials entered all data. A new system was needed that would have Branch-level use and track project development milestones. Traffic Control worked with IT to develop a Traffic Control function within the existing Project Activity and Workday Scheduling (PAWS) system. It was developed, tested and refined. Beginning December 2001, the PAWS system became the new project management application for Traffic Control.	PRECONSTRUCTION	2002	Glenn Dennison	(919) 250-4151
CrashWeb Batch Print Service	Our unit does crash analysis, which requires copying thousands of DMV 349 crash reports. We either had to print off reports from a microfiche machine or from a web application (CrashWeb) which allows retrieval of only one crash at a time. Since no longer keep microfiche copies of any crashes after 2000, we are increasingly dependent upon CrashWeb. It was extremely time consuming, pulling and printing each crash one by one. The solution was for the CrashWeb application to allow for the creation of batches that could be retrieved and printed in one process. The system allows us to copy a list of crashes and paste them into the CrashWeb service and then submit the request. Moments later a batch' is created which can either be viewed or printed.	PRECONSTRUCTION	2002	Jeff Rom	(919) 733-8304

Using OPUS to Control Proposed Bridge Replacement Projects	DOH uses aerial photography to develop base mapping & digital terrain modeling for bridge replacement projects, requiring photo ground control by Location & Surveys to adjust the photography for photogrammetric survey methods & to reference the digital mapping to project coordinate datum for planning, environmental impact studies, design, right-of-way acquisition, & construction. L & S uses Global Positioning System (GPS) technology to provide State Plane Coordinates for required photo ground control points. When controlling bridge replacement projects using GPS technology, the fast static method was applied for the horizontal & vertical coordinate network. It used 1 technician for 4 man-hours to plan, schedule, & post the GPS network data. This method used 3 technicians & 2 vehicles for 2 workdays to set the aerial photo targets (6-8 targets), locate Geodetic control monuments, obtain GPS Obstruction charts, operate GPS session receivers, & remove aerial photo targets from locations after completion of photogrammetric flight. Setting 2 GPS azimuth monuments for an average of 52 man-hours per project and 32 vehicle hours.	PRECONSTRUCTION	2002	Pat Tuttle	(336) 896-7008
SARAH 2.0 (Statewide Authoritative Railroad & Highway	SARAH 1.0 was a MS Access front end application with an Oracle backend which was cumbersome, slow, difficult to maintain & limited to 3-6 users. There were logic problems in the existing Data Model, which caused a series of failures in various required reports. SARAH database maintains inventory records of 10,477 rail/highway crossings in NC, allowing for data-entry, adhoc query capability, trend analysis, rail crossing modeling used in the Crossing Safety improvement programs, project tracking capability, & construction/maintenance contract & payment tracking. SARAH 2.0 was developed in a rapid prototypical environment which resulted in a web browser thin client application with a 3-tier enterprise architecture, allowing SARAH to support 40-50 clients in an intra-net environment. All requests (which include: media, federal & state agencies, special studies conducted by private & public agencies & contractors/consultants) can be accessed by all sections within the Eng & Safety Branch on individual clients computers using of a web browser; allowing instant access to data, reports, analysis & visual information on rail/highway crossings.	TRANSIT - RAIL DIVISION	2002	Ric Cruz	(919) 715-6129
Metal Strain Pole Program	The Structure Design Unit of the Design Branch was interested in improving the turn-around time of the numerous numbers of the tubular structures of signal supports among other assignments of this group. An old DOS analysis program was being used, in addition to hand calculations. Because of the nature of this DOS program, the review of the input prior to printing was impossible, resulting in waste of time and paper. Personnel averaged 6 to 8 hours of calculation per pole, and 24 to 32 hours of calculation per 4-pole intersection. Periodically, because of change in type or specification of the loading, the calculation had to be repeated. The Structure Design Unit team designed a computer program to enter and analyze the data. The goal of the new program is to perform complex structural analyses based on the available information from traffic engineers and in accordance with the latest national code. A statewide standard for the different intersection geometry has been implemented and is in use.	PRECONSTRUCTION	2001	Wahid Naim	(919) 250-4047
Roughness Averaging Automation	Members of the Primary Roads section need to have the ability to quickly sum-up and average a series of values for the processing of the roughness section reports. This task is accomplished by delineating a section of roadway into 1/100ths of a mile and then summing up the inclusive value. This procedure is relatively easy unless the section becomes ponderously long (i.e., keying in 76 entries for a 7.53 mile section without missing a value or the miscounting of entries which would cause an error in the averaging computation). The Geographic Information Systems Unit wrote a visual basic macro that copies the contents of an ascii file into an existing EXCEL worksheet. This spreadsheet was set-up to do summation and average computations using a collapsible or expandable bracketing frame that can slide up and down the column of data creating the bounds for the summation and average calculations.	PLANNING & ENVIRONMENT	2001	Tony Medlin	(919) 250-4188
Utilizing GPS in Gathering HPMS Data	As part of NCDOT's compliance with the FHWA Highway Performance Monitoring System program (HPMS), the Road Inventory section must gather data for specific stretches of existing roadways. The Road Inventory section maintains data for approximately 3,600 samples statewide. While the current method yields accurate data, collecting travel lane curve and grade readings in traffic can be hazardous and time-consuming. A Trimble Pathfinder GPS unit was integrated into the data gathering process, specifically to replace the manual collection method currently used. The present field form was formatted via the Pathfinder software into the hand unit of the GPS. This allows all the required data to be compiled electronically and in one file.	PLANNING & ENVIRONMENTAL	2001	Hardee Cox	(919) 250-4188

"Staking with Ease"	<p>There are various problems associated with staking by pine-wood materials: 1) the material is heavy and cumbersome and must be sorted and placed within limited confines of the survey vehicle; 2) the control stakes require attaching flagging that when placed in pastures, cattle and/or horses frequently ingest the vinyl material torn from the stakes; 3) repeat handling is necessary because all the stakes are written up at once, then sequentially loaded into the vehicle and distributed on site at required locations; 4) stakes must be driven into sometimes hard, dry, or even frozen ground by a 10 or 12 pound sledge hammer which is a potential risk factor; and 5) wooden stakes have a short duration period and re-staking is necessary.</p> <p>A new process utilizing wire stakes secured with a vinyl flag was implemented by the survey stakeout time in Division 10. They weigh less than four pounds each and can be easily placed with a wire flag tool. This eliminates repeat handling of bulky, heavy wooden materials and no prior distribution or laying-out on site is necessary.</p>	OPERATIONS DIVISION 10	2001	Ronald Posey	(704) 982-0104
A Boom Mower Improvement	<p>There has been a problem with debris getting stuck between the screen/plexiglass and glass on boom mowers, which impairs the operator's visibility. Objects thrown by the mower have also shattered the cab's glass windows and doors.</p> <p>The Beaufort County Maintenance unit has investigated the feasibility of ordering boom mowers with shatterproof glass, which would eliminate the need to retrofit the cab with an expanded metal screen or plexiglass over the cab's glass. It would improve the operator's visibility as well as make it easier and safer to clean the glass.</p>	OPERATIONS DIVISION 2	2001	R. A. Lewis	(252) 946-3054
Sluice Gate Rod Cover	<p>A number of roadside hazardous spill containment devices have been installed in Orange County to help prevent accidental releases of hazardous substances in the event of a traffic accident. The devices are controlled by manually operated sluice gates, which can contain the flow of a hazardous material in a stilling basin. These gates utilize a large hand wheel to turn a threaded rod that lifts a gate valve. The rod is exposed to weather and has required cleaning and lubrication approximately six times per year.</p> <p>The Orange County Maintenance team fabricated a cover for the rod by using scrap PVC pipe and fittings. The cover slides over the threaded rod and eliminates the loss of lubricant due to rain and wind. The cover can remain in place continuously, including during operation.</p>	OPERATIONS DIVISION 7	2001	Chuck Edwards	(919) 7152533
Drill Press for Concrete Patching	<p>Concrete patching is necessary when a concrete slab breaks or potholes occur. Holes are drilled (doweled) into the existing damaged concrete so that rebar (steel bars) can be placed on six-inch centers across the width of the area to be patched. The rebar is placed in the doweled holes to serve as a load transfer mechanism from the new to the old concrete which ties everything together.</p> <p>The existing drill used weighs eighteen pounds and requires two people because of the awkward positioning of bending and/or squatting. Drilling the holes would be similar to jackhammering horizontally about five inches off the ground.</p> <p>The Forsyth Maintenance team started using a new drill press for concrete patching that is easier to use and only requires one person to operate.</p>	OPERATIONS DIVISION 9	2001	Gary Neal	(336) 896-7014
Distribution of Pavement Review Packets Using Website	<p>Every month a review of TIP project pavement designs is held. Typically, the review will cover four projects and for each project the pavement designer prepares a summary of two to four alternative pavement designs and summary design inputs. The report prepared by the Geotechnical Unit is also attached. In the past, this information was compiled for all the projects for that month, a cover sheet was attached, and copies were prepared for everyone invited to the Pavement Review Committee meeting. Typically, 25 copies would be made and then hand-delivered to Raleigh attendees and delivered by courier service to Division personnel. In order to improve the process, reduce copying, and save the delivery time, the Pavement Design team started scanning the review package information and posting it on the Pavement Management Unit website. An email message is then sent to all individuals who previously received review packets alerting them of the new material, including a hot button to access the material for review.</p>	OPERATIONS CONSTRUCTION	2001	Judith Corley-Lay	(919) 250-4094

Secondary Road Construction Plans	Each year the Elkin District Office is responsible for staking, preparing construction plans, obtaining right-of-way, and construction for approximately 30 unpaved roads in its three counties. In previous years, the construction plans, better known as Straight-Line Diagrams, were drawn by hand. This was a slow process for one employee, so sections of the project were distributed equally between members of the survey crew. This process would occupy a 3-man crew for a whole day. Right-of-way problems were frequently encountered causing revisions that were difficult to make and time-consuming since the plans were drawn by hand. With the implementation of Microstation in the District Office, the construction plans are now prepared using the computer. The survey crew can remain on schedule with one member preparing the plans on CADD while the other crew members continued staking the remaining roads on the Secondary Construction Program. In addition, any construction plan revisions are much easier and less time-consuming to perform using the computer.	OPERATIONS DIVISION 11	2001	Charles Reinhardt	(336) 835-4241
Backpack Sprayer Holder	Storing backpack sprayers during transit has interfered with removing traffic control signs. The backpacks also restrict rear view mirror vision and have been subject to damage and spillage. The Surry County Herbicide Crew designed a backpack holder that is portable and mounts into sign rack standard holes. The holder will secure two backpack sprayers, keeping them secure during transit and preventing possible spillage and damage. In addition, the newly designed backpack holder eliminates rear view mirror vision problems, eliminates interference with traffic control sign removal and allows easy access to backpacks.	OPERATIONS DIVISION 11	2001	J. A. Edsel	(336) 903-9240
Light Emitting Diode (LED) Signal Module Evaluation	To ensure that LED modules are visually effective and will provide a safe traffic flow under windy, swaying conditions, they are visually evaluated. The evaluation process required 17 people and one bucket truck for eight hours for every evaluation. The evaluating observers would determine whether there was a significant reduction in the brightness of the indication prior to being obscured by the visor. This test method allowed some variability in the testing parameters from each test set-up. Vendors suggested the variable test parameters could have a negative effect on the evaluation of their products. To develop a more objective visual evaluation, a new test fixture was designed and installed at a new test site that did not require the bucket truck to mount and change the modules. The test fixture allows more accuracy in determining when the signal indication blanks out during swaying by using a mechanical tilting mechanism, and cuts the evaluation time in half.	PRECONSTRUCTION	2001	Ken Morge	(919) 233-1209.
Concrete Deck Patching	The use of Duracal Quickset in concrete deck patching requires demolition of potholes. It is water-based, cannot be used below 32 degrees, cracks during curing, has long set-up and drying times, and durability is usually less than one year. In order to improve the process of patching potholes, the McDowell Bridge Maintenance used a magnesium and ammonia-based product called MG KRETE to repair three decks. This product sets-up four times faster, does not require demolition, does not freeze or crack, can be used in below freezing temperatures, is less labor intensive and is very durable. The following is a comparison of labor hours for three bridge projects:	OPERATIONS DIVISION 13	2001	Ken Anderson	(828) 298-1128